Chapter 1

The Scientific, Policy, and Theoretical Foundations for the National 5 A Day for Better Health Program

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INTRODUCTION

The national 5 A Day for Better Health Program (5 A Day), which was initiated in 1991, is a large-scale, public/private partnership between the vegetable and fruit industry and the U.S. Government. Its goal is to increase the average per capita consumption of vegetables and fruit in the United States to five or more servings every day. The long-range purpose is to help reduce the incidence of cancer and other chronic diseases through dietary improvements. The specific program objectives are to increase public awareness of the importance of eating five or more servings of vegetables and fruit every day and to provide consumers with specific information about how to incorporate more servings of these foods into their daily eating patterns.

The private side of the partnership is coordinated by the Produce for Better Health Foundation (PBH), a nonprofit organization composed of approximately 1,000 members of the fruit and vegetable industry. The public side of the partnership is coordinated by the National Cancer Institute (NCI) of the National Institutes of Health, U.S. Department of Health and Human Services (DHHS). The goal of the Program coincides with one of the national health objectives for the country, which encourages the population to eat five or more servings of vegetables and fruit each day, and is also consistent with all other national dietary guidance provided by the U.S. Government (DHHS, 1990, 1998; U.S. Department of Agriculture (USDA)/DHHS, 1995, 2000; USDA, 1992).

The purpose of this monograph is to provide a detailed description of the national 5 A Day Program so that this model of a public/private partnership can be used by others. The introductory chapters (1 and 2) describe the Program's origins, scientific rationale, and structure, and model agreements are provided in the appendices. Case studies and specific examples of activities are provided for the Program components and partners, including the industry, the State health agencies, and the media (Chapters 3 through 6). Overviews of process and outcome evaluation research are

provided (Chapters 7 and 8). The nine randomized community intervention research projects supported through the 5 A Day Program, as well as their outcomes, are described (Chapters 9 through 11). The closing chapters present an overview of international efforts and future directions (Chapters 12 and 13).

This chapter provides the foundation for the rest of the monograph. It describes the scientific rationale for the Program, the Program policy context, the need for the Program based on national vegetable and fruit consumption levels, the history of the Program's origins through an NCI grant to the California Department of Health Services in 1986, and the behavioral theories that were proposed to guide program implementation at all levels.

SCIENTIFIC RATIONALE FOR THE 5 A DAY PROGRAM

The Diet and Cancer Link

The development of the national program required a strong scientific rationale, which was just emerging in the early 1990s from progress in diet and cancer research. The concept that diet has an influence on cancer risk can be traced to the first century A.D. However, during the 20th century, the dietary link was increasingly discounted in favor of theories about genetics, exposure to viral or chemical carcinogens, and increased research into the effectiveness of cancer treatments, such as surgery, radiotherapy, and chemotherapy (World Cancer Research Fund (WCRF), 1997).

In the 1960s, the interest in dietary causes of human cancer was slowly revived by both the diffusion of the experimental model of laboratory chemical carcinogenesis and by migrant epidemiological studies suggesting that cancers are largely environmental in origin (Tannenbaum and Silverstone, 1957; Doll, 1967; Higginson and Muir, 1973). Specific hypotheses about diet and cancer emerged in the 1970s. Interest grew in the effects of fat, fiber, alcohol, and pickled foods (Nestle, 1992). Insights into the cancer process increasingly suggested that diet might play a role in all stages of cancer development.

Vegetables, Fruit, and Cancer

It was not until the late 1980s and early 1990s, however, that recognition of the role of plant foods in the diet began to coalesce. Summaries of the epidemiological literature specific to the relationship between vegetables and fruit and cancer were just emerging (U.S. Public Health Service (PHS), 1988; National Research Council (NRC), 1989; Willett, 1990; Negri et al., 1991; Steinmetz and Potter, 1991a,b; Ziegler, 1989, 1991; Block et al., 1992).

Block and her colleagues at NCI produced one of the early review articles (Block et al., 1992). They found that in 128 of 156 retrospective and prospective dietary studies calculating relative risk, a statistically significant inverse association was found between vegetable and fruit consumption and the occurrence of cancers in 13 different anatomical sites. These were cancers of the oral cavity, esophagus, pharynx, larynx, stomach, pancreas, colon, rectum, lung, bladder, endometrium, cervix, and ovary. Similar findings had been published the previous year by Steinmetz and Potter (1991a,b). It became clear for the first time that, of all the dietary factors postulated to be related to cancer, the evidence was most consistent for an inverse association between the risk of cancer and vegetable and fruit consumption.

The Strength of the Evidence

The epidemiological evidence has many characteristics—consistency, evidence of a dose-response relationship, and plausible biological mechanisms—that strengthen the case for a valid inverse association between vegetable and fruit consumption and the risk of cancer.

Consistency

In the 1992 Block and colleagues analysis, 82 percent of studies demonstrated such a statistically significant inverse association. Similar results were found in the 1991 Steinmetz and Potter analysis. Such a high proportion of studies with similar results is an indication of the strength of the evidence. It is reasonable to question whether there are other demographic or lifestyle factors associated with high vegetable and fruit consumption that are the true causative agents. However, many studies have controlled for smoking and other potential dietary confounders, such as fat, calo-

ries, and alcohol, and the beneficial effect of higher vegetable and fruit consumption remains. It is unlikely that nondietary factors totally explain the risk. Furthermore, studies reviewed by Block and colleagues were conducted in 17 different countries with diverse populations, such as those in The Netherlands, China, India, and the United States. Despite the diversity of lifestyle correlates in these cultures, these studies reached similar conclusions related to the value of vegetables and fruit in cancer reduction. In addition, these studies have used varied methods, designs, and dietary instruments. Thus, the consistency of results provides support for the validity of the association.

Dose-Response Relationship

The results are not only statistically significant but also clinically important. In the majority of studies, a dose-response relationship was found. People in the lower quintiles of vegetable and fruit consumption experienced a cancer risk approximately twice as high as people in the higher quintiles of consumption. The best estimates of U.S. population consumption levels, at the time the national 5 A Day Program originated, came from national surveys. The National Health and Nutrition Examination Survey (NHANES) II, using a single 24-hour recall, indicated that adults in the bottom quintile of consumption averaged one serving per day; adults in the top quintile averaged five servings per day (Patterson et al., 1990). Although no studies have tested the impact of specific numbers of servings on cancer risk, the data suggest that consuming more is better.

Plausible Biological Mechanisms

Adding to the weight of the evidence is the existence of plausible biochemical mechanisms for the effects of vegetables and fruit. Vegetables and fruit are sources of vitamins and minerals (including vitamins A, C, and E and folate), carotenoids and other antioxidants, and various phytochemicals such as dithiolthiones, flavonoids, glucosinolates, and allium compounds. Each of these substances may play a role in reducing cancer risk. More likely, it is a combination of these factors, and others not yet explored, that may confer protection.

Although little research on this topic was available at the beginning of the national 5 A Day Program in 1991, recent research has begun to explore potential hypotheses and mechanisms. For example, one hypothesis is that oxidative cellular damage to DNA may produce mutations, which in turn may result in the development of cancer cells. Several recent studies have demonstrated a reduction in oxidative DNA damage by increased consumption of single vegetables, such as brussels sprouts and spinach powder (Pool-Zobel et al., 1997; Verhagen et al., 1995). In addition, a recent study has compared the effects of two diets: one low in vegetables and fruit (3 to 4 servings) and one high in vegetables and fruit (10 or more servings). There was a significant reduction in DNA and lipid oxidation attributable to the consumption of a high vegetable and fruit diet (Thompson et al., 1999). In the future, more studies of this nature will be attempting to define the mechanisms by which vegetables and fruit confer protection.

Recent Reviews

Since the Program was initiated, several other extensive reviews of the world literature have added weight to the accumulated evidence. The review edited by Trichopoulos and Willett (1996) indicated that the evidence for a positive association is accumulating even for hormone-modulated cancers. The most extensive review to date was published by the WCRF. This review analyzed the evidence by anatomical cancer site, dietary constituent, and food group and concluded with a set of dietary recommendations. The relationship between cancer risk and vegetable and fruit consumption was assessed in 37 cohort, 196 case-control, and 14 ecological studies. The authors noted that, "Overall, when cancers of all anatomical sites are taken together, 78 percent have shown a significant decrease in risk for higher intake of at least one vegetable and/or fruit category examined" (WCRF, 1997, p. 441). Recommendation 4 of the review states: "Eat 400-800 grams (15 to 30 ounces) or five or more portions (servings) a day of a variety of vegetables and fruits, all year round" (WCRF, 1997, p. 512). Thus, the recent data continue to support the recommendations of the 5 A Day Program.

Randomized Clinical Trials

The major criticism of the current evidence is the lack of randomized clinical trials indicating that

diet-related interventions would reduce cancer risk, incidence, or mortality. Such trials have been attempted with some of the phytochemicals found in vegetables and fruit that were judged to be promising in the 1980s. Three examples that were funded by NCI—the Alpha-Tocopherol, Beta-Carotene (ATBC) study, the Beta Carotene and Retinol Efficacy Trial (CARET), and the Physicians' Health Study—did not support a beneficial effect of these particular components. In the ATBC study, 29,133 male Finnish smokers, ages 50 to 69, were supplemented for 5 to 8 years with alpha tocopherol, beta carotene, or both. An 18-percent increase in lung cancer was observed for men taking beta carotene. Although there was a decrease in prostate cancer for men taking alpha tocopherol, there was also an increase in hemorrhagic stroke (ATBC Study Group, 1994). Investigators of the CARET study terminated the intervention prematurely, after 4 years of intervention, because interim results indicated a 28-percent increase in lung cancer in subjects taking beta carotene and vitamin A (Omenn et al., 1996). The Physicians' Health Study ended on schedule in 1995, after 12 years of treatment of 22,071 male physicians taking 50 mg of beta carotene or placebo every other day. Results indicated no evidence of either benefit or harm from beta carotene supplements on either cancer or cardiovascular disease (Hennekens et al., 1996).

One possible interpretation of these findings is that scientists have not successfully isolated the combination of bioactive substances in vegetables and fruit that confer protection and, consequently, food consumption remains preferable to supplement consumption. This concept is supported by the authors of the WCRF review, who concluded: "The most appropriate approach to the prevention of cancer by dietary means is to emphasize foods and drinks in the contexts of whole diets, within existing cuisines and cultures" (WCRF, 1997, p. 17).

Clearly, more research needs to be done to elucidate the roles of vegetables and fruit in cancer etiology and to examine the mechanisms by which they may confer protection. Several randomized, controlled clinical trials with foods are under way, and these should supply valuable data.

In the meantime, even without more precise etiological data, there is abundant evidence to suggest that substantial health benefits could be achieved by increasing the population's consumption of vegetables and fruit. Based on the evidence available in 1991, which has only grown stronger, the national 5 A Day Program was launched. This evidence also contributed to a national nutrition policy, which further supported the development of the 5 A Day Program.

POLICY CONTEXT

Part of the foundation for the development of the national 5 A Day Program was provided by a series of scientific publications, which formed the basis of national nutrition policy in the 1980s and 1990s. In 1981, Doll and Peto published a paper, commissioned by the U.S. Congress, indicating that approximately 35 and 30 percent of all cancer deaths were related to nutrition and smoking, respectively. The range for nutrition was 10 to 70 percent, and the estimates for some specific sites included the following: 90 percent for stomach and colon cancers; 50 percent for endometrium, gallbladder, pancreas, and breast cancers; and 20 percent for lung, larynx, bladder, cervix, mouth, pharynx, and esophagus cancers. The estimate that at least 35 percent of cancer deaths are diet-related has been affirmed more recently by several sources (NRC, 1989; Doll, 1992; Ames et al., 1995; WCRF, 1997).

In 1982, NRC published the seminal document, *Diet, Nutrition, and Cancer* (Assembly of Life Sciences, 1982), which summarized the research literature on the relationship between various chronic diseases and dietary patterns. Other Federal documents followed, such as *Healthy People 2000* (DHHS, 1990), the first *Surgeon General's Report on Nutrition and Health* (PHS, 1988), *Nutrition and Your Health: Dietary Guidelines for Americans* (USDA/DHHS, 1990), and *The Food Guide Pyramid* (USDA, 1992).

Another important document was NCI's *Cancer Control: Objectives for the Nation, 1985-2000* (NCI, 1986). In this monograph, NCI projected that 30,000 lives could be saved annually through modification of dietary habits. It was noted that the same dietary changes would also reduce the occurrence of heart disease.

The monograph estimated that by the year 2000, cancer mortality could be reduced by 8 percent through diet, 8 to 15 percent through tobacco control, 3 percent through early detection, and 10 to 26 percent through improved cancer treatments (NCI, 1986). These projections made primary prevention as quantitatively significant as medical approaches.

The NCI's cancer control objectives called for the population to reduce fat consumption to 30 percent or less of calories and to increase fiber consumption (including vegetables and fruit) to 20 to 30 grams per day. The appropriate roles for NCI, as stated in the publication, included guiding and supporting research on the cancer-related effects of dietary fat and fiber, chemoprevention, and dietary behavior and conducting public education programs about the health advantages and cancer risks of relevant dietary components. A list of recommended actions for State and local health agencies was also provided and included 1) reviewing school menus and educational programs in relation to NCI's dietary recommendations, 2) assisting private-sector groups to modify health promotion programs to include cancer risk reduction, 3) encouraging restaurants to provide sufficient information to consumers for choosing nutritious foods, 4) coordinating activities with State departments of agriculture and aging, 5) working with local mass media to educate the public, and 6) addressing the needs of high-risk populations (NCI, 1986). All of these roles for State health agencies were ultimately incorporated into the State component of the national 5 A Day Program (see Chapter 3).

In summary, NCI staff used all the documents previously listed to ensure that policies for developing the 5 A Day Program would be consistent with all national nutrition policies. In addition, open dialog was maintained with those developing initiatives in other Federal Government agencies, such as the food labeling regulations under development by the Food and Drug Administration. Issues or concerns raised by industry or public partners about the Program criteria were debated by convening ad hoc advisory groups of experts.

Although NCI staff could establish a scientific rationale for the Program and ensure its consistency with national nutrition policy, it was also necessary to document the need for such a program.

NEED FOR THE PROGRAM: VEGETABLE AND FRUIT CONSUMPTION

Consumption Data Available in 1991

Dietary consumption data indicated a need for the program. National survey data that were readily available in 1991 were from the 1976-80 NHANES II study (Patterson et al., 1990) and the 1985 Continuing Survey of Food Intakes by Individuals (CSFII) (USDA, 1986). Both the NHANES II dietary data on adults and the CSFII data on women indicated that mean intake of vegetables and fruit was 2.9 servings, including french fries (USDA, 1987; Patterson and Block, 1991) (see Table 1). (French fries are not included in measurements of intakes by the 5 A Day Program because their consumption is prevalent in the population, they are a significant source of fat, and an increase in the consumption of french-fried potatoes was not considered a desirable Program outcome.)

In response to industry enthusiasm, the PBH Foundation promised its members a 5 A Day Program kickoff at the Produce Marketing Association annual convention in October 1991. As a result, the NCI and PBH Foundation staffs moved quickly to get a baseline survey in the field by the summer of 1991, before industry initiatives might affect public awareness. Data on a nationally representative sample of 2,837 persons, with an oversampling of African-Americans and Hispanics, were collected by telephone using a food frequency questionnaire (see Chapter 7 for more details). The results indicated that the median intake was 3.4 servings a day and the mean intake was 3.8. Differences between the 5 A Day baseline and the NHANES II and CSFII surveys reported above are a combination of actual change over time, differences in methods (including assessment instruments and methods of calculating servings), and populations surveyed (see Table 1). Only 23 percent of the population was consuming five or more servings of vegetables and fruit per day.

Consumption Data Available Since 1991

These numbers were further supported when the CSFII data on 8,181 adults became available for 1989-1991. Researchers at NCI and USDA

Table 1. U.S. Vegetable and Fruit Consumption.

Survey	*Dates*	*Sample*	*Instrument*	*Mean Vegetable and Fruit Intakes*	*Percentage of Population Eating 5+ Servings*
NHANES II [1]	1976-1980	10,313	Single 24-hour recall	2.9 [2]	9% [2,3]
CSFII [4]	1985	915	Four 24-hour recalls	2.9 [2,5]	—
CSFII	1989	4,063	Food records and 24-hour recalls	3.4 [2]	—
5 A Day	1991	2,837	Food frequency questionnaire	3.8 [6]	23% [6]
CSFII	1989-1991	8,181	Food records and 24-hour recalls	4.3 [2]	32% [2]

[1] NHANES II = National Health and Nutrition Examination Survey II.
[2] Includes french fries.
[3] 5 A Day defined as three mentions of vegetables and two of fruits.
[4] CSFII = Continuing Survey of Food Intakes by Individuals.
[5] Women only.
[6] Excludes french fries.

collaborated on a method for disaggregating foods into their component ingredients. All vegetable and fruit ingredients were assigned weights to correspond to a dietary guidance serving, and total numbers of servings were tallied. This method ensured that vegetables and fruit in mixed dishes or those consumed in smaller amounts than a serving (e.g., a leaf of lettuce on a sandwich) all contributed to the final tally. Thus, the results reflected more servings than those previously measured with other methods. The mean intake for adults, including french fries, was 4.3 servings. Mean intake, excluding french fries, was 3.9 servings, which is close to the 5 A Day baseline results reported above. Even with this meticulous inclusion of all possible sources of vegetables and fruit, including those in baked goods, only 32 percent of Americans were consuming five or more servings per day. It should be noted that the epidemiological data that helped establish the number "5" did not include vegetables and fruit as parts of pies, soups, or other mixed dishes. Therefore, it is not obvious that inclusion of the disaggregated foods is an appropriate benchmark by which to judge whether Americans are approaching a cancer-protective level of vegetable and fruit intake.

All of the data above pointed to the need for action. The 5 A Day baseline survey indicated that all age, ethnic, and gender groups in the population were eating less than the recommended amount of vegetables and fruit. A national campaign seemed appropriate if leading health agencies such as NCI were to seriously contribute to achievement of the year 2000 objectives. Once the need for the program was clear and the scientific rationale seemed adequate, the next question to be addressed by NCI staff was how the program would change consumption levels. For answers, the staff turned to the behavioral science literature and existing examples of community-based interventions.

BEHAVIORAL SCIENCE JUSTIFICATION FOR A NATIONAL PROGRAM

Some of the questions that NCI staff needed to address included: How can a national partnership increase vegetable and fruit consumption? How do people change behaviors? What strategies are necessary to help them?

These questions led to a thorough investigation of what was known at the time about behavior-change theories and community-based interventions. This section contains portions of the justification for a national program provided to the NCI's board of external advisers in 1991.

Role of the Media

Various studies have shown that the media play a vital role in increasing consumer awareness of health issues and, in some instances, even in changing individual patterns of behavior (Levy and Stokes, 1987; Davis, 1988; Russo et al., 1986). Public confidence in messages from a credible health agency such as NCI has been shown to be a key factor in affecting consumer buying patterns (Hammond, 1986). In addition, credible health messages promoted through industry via the media have been shown to be effective in influencing consumers. For example, sales of high-fiber cereals rose dramatically after a national advertising campaign by the cereal industry utilized NCI-approved health information (Levy and Stokes, 1987). Hammond's study also found that an individual's stated behavioral intentions seem to be affected by the perception of the credibility of the information source. Thus, in the high-fiber cereal campaign, public confidence in NCI was a key factor in changing consumer buying patterns.

Data suggest that although the public is concerned about diet and health, there is a lack of the detailed knowledge needed to act effectively on these concerns (Levy et al., 1988). Although use of the media alone can produce behavioral change, the effect is increased when its use is supplemented by other community-based educational efforts (Farquhar et al., 1977; Puska et al., 1985; Flay, 1987). These efforts can build on the awareness created by the media to provide the skills necessary for people to make lifestyle changes.

Community-Based Health Promotion Trials

In 1991, the published papers from the community-based cardiovascular health promotion trials were showing positive results. The Stanford Three-Community Study was successful in reducing the coronary risk factors of people in two communities when compared with a control community (Farquhar et al., 1977). It demonstrated that the health of a community could be improved by an educational message delivered through the media and interpersonal channels. Mass media campaigns brought about favorable changes in dietary practices after about $2^1/_2$ years (Stern et al., 1976). Even more rapid changes occurred when personal counseling and intensive instruction were combined with mass media.

The North Karelia Project in Finland was able to demonstrate decreases in cardiovascular mortality and morbidity as well as risk factor reduction through a comprehensive community health promotion program that included public education strategies (Puska et al., 1983). The Pawtucket Heart Health Program, which reached blue-collar consumers through successful social marketing strategies, was able to attract low-literacy populations through simple, specific messages. Simplicity of message has been shown to be a key factor in successful mass media campaigns (Wallack, 1981).

The Stanford Five-City Project, which tested whether communitywide health education could reduce stroke and coronary heart disease risk, showed significant net reductions in community risk-factor averages in the treatment cities. The risk-factor changes resulted in important decreases in both composite total-mortality risk scores and coronary heart disease risk scores (Farquhar et al., 1990). The treatment cities received a 5-year, low-cost (about $4/person/year), comprehensive program based on community organization principles and social marketing methods, including use of mass media. Total exposure to educational messages of various types and duration was calculated to be 100 messages per year, totaling 5 hours per capita. Yearly radio and television exposure was less than 1 hour per adult per year. Researchers concluded that such low-cost programs can have an impact on risk factors in broad population groups.

A later overview of the Minnesota Heart Health Program, one of the cardiovascular health promotion trials, indicated that after 13 years, the overall program effects were modest in size and duration and were not statistically significant, although many intervention components were effective in targeted groups (Luepker et al., 1994). It is postulated that secular trends make it difficult for community-based research programs, such as the ones discussed above, to produce significant results. However, evidence would still suggest that the theoretical constructs and strategies used in these intervention programs can be effective.

BEHAVIORAL THEORIES USED IN THE 5 A DAY PROGRAM

Three major theories, based on the theoretical models used by the cardiovascular health promotion trials, were chosen to guide the national 5 A Day Program, and the California 5 a Day Campaign provided the model for the national program (discussion follows). These theories were the Health Belief Model (Janz and Becker, 1984), Social Cognitive Theory (Bandura, 1977, 1986), and Transtheoretical or Stages-of-Change Model (Prochaska and DiClemente, 1992). In addition to these theories, the techniques of social marketing have guided the communications strategies for the program. These theories and models have been clearly presented elsewhere (Glanz et al., 1997), and further information on them can be found in Chapters 6 and 8 to 11.

As the 5 A Day Program began to be implemented, the most important constructs or ideas from these theories were consistently applied to the guidelines provided to each partner category: retailer, produce marketer and supplier, merchandiser and service supplier, noncommercial food service, commercial food service, and health agency. Table 2 provides the schema that was used to guide program implementation.

In the schema, the channels are specific avenues or settings for reaching the population, such as worksites. Each setting has specific characteristics that might be used to help change behaviors. For example, the ability to reach children through classrooms and lunchrooms makes schools attractive as a channel for improving dietary behaviors. The column headings in the schema cover most of the components necessary to change behaviors. Some level of awareness is required. If people are eating two servings of vegetables and fruit per day and do not know that they should be eating at least five, they are unlikely to recognize the need to change their behavior. In addition to awareness, individuals must be motivated to make a change, and motivational factors may vary widely with age, cultural background, income, and gender. It may be necessary to teach the skills necessary to make dietary changes; these may include knowledge of appropriate choices, habits of food preparation, and methods of enhancing convenience. Changing

Table 2. Matrix of Theoretical Constructs by Channel.

Channels (examples)	*Awareness/ Knowledge*	*Motivation*	*Skills Building*	*Environment*	*Social Support*	*Policy*
Media						
Supermarkets						
Schools						
Worksites						
Food assistance programs						
Churches						
Food service/ restaurants						
Health care settings						

NOTE: The channels are settings for reaching the population. The constructs are important components that various theories suggest are necessary to change behaviors.

food environments might consist of working with schools' food-service staff to increase vegetable and fruit choices or preparation methods, working with worksite cafeterias to do the same, and working with restaurants to enhance their vegetable and fruit offerings. Social support from family and friends is usually quite helpful in creating and maintaining new food habits, and institutional policies can also be supportive. For example, a worksite catering policy might be that all worksite-sponsored meals and breaks (e.g., at meetings) have vegetable and fruit choices: if bagels are offered, fresh fruit would also be offered.

These theoretical constructs have been incorporated into the guidelines for all licensed 5 A Day Program participants, and some were used in the community-based research grants. (See Chapter 2 for a discussion of licensing agreements with 5 A Day partners.) The use of common constructs by all partners in all channels has kept the Program focused on the activities and messages most likely to create behavior change.

THE PROGRAM ORIGIN

California Department of Health Services

The staff of the California Department of Health Services used the scientific and policy documents available in 1986 to successfully compete to receive a 5-year NCI capacity-building grant for about $1.5 million. The purpose of the grant was to develop staff abilities within the State health department to conduct cancer prevention and cancer control programs. The California grant focused on nutrition, one of the least-researched components of cancer control. Staff developed a model for statewide dietary change, based on community cardiovascular research, with three types of simultaneous activities: public awareness and professional education, food system change, and organizational change.

Program initiation took 9 months and consisted of recruiting specialized staff in nutrition education, epidemiology, and marketing and then meeting with prospective public and private collaborators. The planning phase involved small-area surveys of consumption and a structured planning process that resulted in the decision to narrow the effort to the promotion of vegetables and fruit. Because California is a major producer of vegetables and fruit in the United States, collaboration between the State health department and agriculture was advantageous. With the help of the State Department of Food and Agriculture, health department staff members formed a steering committee of recognized leaders in the produce industry. This committee advised the program to take a campaign approach, which was familiar to industry. Heeding this advice, the health department developed a campaign logo and slogans, and a public/private partnership was born.

For each campaign, staff identified a theme, secured media coverage, developed print material for the public, and helped retail partners reinforce the message at the point of sale. Free brochures were offered through NCI's toll-free telephone line, the Cancer Information Service. The supermarket partners received theme-related, camera-ready advertising copy; line art; signs; tipsheets; consumer brochures; and scripts for radio announcements or in-store audio. This level of effort cost about $150,000 annually for the 2 years of the public campaign.

Impact evaluation of the campaign was not possible because the campaign lacked an experimental design. Nevertheless, in addition to the favorable process measures of media coverage and industry participation, statewide population surveys indicated that consumption had increased, hinting at the campaign's success. Between 1989 and 1991, vegetable and fruit consumption rose by 0.3 serving for both White and African-American adults in California, a rate four times higher than for secular trends (Foerster and Hudes, 1993).

Beginnings of the National Program

Over the years, coverage by the trade press and presentations at professional meetings had resulted in considerable interest in the campaign outside of California. The campaign was perceived as successful by the industry partners and by staff in other health departments, who wanted to replicate the program in their own States.

Rather than work with individual States, the industry members were more interested in a national campaign that would be compatible with

their national distribution systems. Therefore, the board members and staff of the California project approached NCI to suggest the development of a national program.

Preliminary work to build this collaborative process began with a meeting in December of 1990 with 15 industry representatives, 3 representatives from the California program staff, and NCI staff. The case for a national program was made, and all industry representatives indicated their desire to participate. However, the mechanics of how to proceed were not clear. NCI is a research organization and has no appropriate infrastructure for operating a national program of this nature, and the industry operated competitively, with little history of the collaboration that would be necessary on a national level with a proactive marketing program like 5 A Day. Prior collaborations had centered on responses to public concerns about food safety.

It was the formation of PBH in May 1991 that enabled the plans for a national program to proceed. Approximately 60 companies or commodity groups contributed $415,000 to create the Foundation, which then worked with NCI to launch a national 5 A Day Program. The nonprofit PBH functions as a partner with NCI and oversees industry participation, enabling NCI to interface with only one industry organization.

The Program logo and slogan had been service-mark protected by the California Department of Health Services. Therefore, it was necessary to develop a series of agreements between California, NCI, and PBH to enable the Program to develop at the national level. These agreements are described in Chapter 2.

NCI Approval

When it appeared that legal agreements would be possible with California and the industry, NCI staff initiated the procedures for obtaining Federal Government approval for funding such an effort. It was necessary to convince the Board of Scientific Counselors (external advisers) of NCI's former Division of Cancer Prevention and Control (now the Division of Cancer Control and Population Sciences) that such an effort was needed and would enhance the Institute's research portfolio. The Program's vision had to be both specified and justified. To this end, a concept paper was developed, with research objectives, scientific justification, a project description, and a budget.

The Program concept was presented to the board by NCI staff. Discussion ensued among the board members, NCI staff, and an industry representative about the scientific evidence supporting the vegetable and fruit cancer prevention connection and the relative priority of such an effort. The primary emphasis of the concept was on research, with some resources for a media effort. The plan was that PBH would complement NCI's efforts by focusing its resources on a campaign to reach the public with the 5 A Day message.

The NCI concept was approved in October 1991 with a budget of $27 million for 5 years, with the option to continue the program for a second 5-year period. (See Chapter 2 for more budget information.) The concept formed the basis of a request for research applications, which provided the bulk of the designated dollars ($16 million) to community-based research efforts to test in controlled trials the impact of 5 A Day interventions on dietary behaviors (see Chapter 8).

THE PUBLIC/PRIVATE PARTNERSHIP

Because the national program grew out of the public/private partnership that emerged in the California 5 a Day—For Better Health! Campaign, such a partnership became an assumed feature of the national program. Previous attempts at partnerships between the food industry and health agencies had suffered from what appeared to be antithetical missions (e.g., the desire of health agencies to reduce fat consumption in the population and the concern by the meat and dairy industries that such a message would reduce sales of their products). The new and refreshing feature of the national 5 A Day partnership was the potential for a win/win collaboration—the health message to eat five or more servings of vegetables and fruit was consistent with the vegetable and fruit industry's desire to sell more of its products. Thus, the missions of the public and private sectors converged.

In addition, the public health partner, NCI, brings a scientific credibility to the message to eat more vegetables and fruits that the industry would

not have on its own. (See the section above titled "Behavioral Science Justification for a National Program" for more discussion.) The public sector also provides health professionals who have the necessary scientific expertise, health promotion skills, and collaborative experience, as well as a focus on research and evaluation, to keep the program moving ahead.

Major attributes that the industry brings to the partnership are direct access to consumers, communications expertise, and resources. Industry members have the consistent ability to reach nearly all consumers with messages at the point of purchase (e.g., supermarkets, restaurants, other food venues). They have staff and consultants trained in effectively selling products to consumers. They also have sizable budgets dedicated to marketing, special promotions, advertising, and other media campaigns. The redirection of some of these marketing dollars into the promotion of a generic health message assists the public health sector in reaching many more consumers than ever could be possible using public health budgets alone.

Thus, the final scenario is really a win/win/win situation. The public health sectors of the United States win by using industry communications expertise, access to consumers, and marketing dollars to diffuse an important public health message. If the public increases vegetable and fruit consumption, the public wins by improving long-term health and the quality of life. Finally, the private sector wins by increasing current and future sales (assuming that a healthier population buys more and may live longer, leading to even more sales).

THE NUMBER "5" AND PROGRAM STRATEGIES

The California program set the goal of "5" servings using several parameters. The number had to be biologically significant and clear, actionable, and memorable to consumers. The definition of servings had to be understandable, consistent with common household portions, and perceived as reasonable. Servings used in the USDA's dietary guidelines were chosen (see Table 3).

Table 3. 5 A Day Vegetable and Fruit Servings.

1 medium-sized piece of fruit
1/2 cup of raw, cooked, canned, or frozen vegetables or fruit
1 cup of leafy salad greens
1/4 cup of dried fruit
3/4 cup (6 ounces) of 100% fruit or vegetable juice
1/2 cup of cooked or canned beans or peas (legumes, e.g., lentils, pinto beans, kidney beans)

SOURCE: NCI, *5 A Day for Better Health Program Guidebook*, October 1999.

The California project chose the number "5" before it was well supported in published literature. The national program sought confirmation of this number choice. Rough calculations from the Block review indicated that people who were at lower risk of cancer were consuming about five servings of vegetables and fruit a day (Block et al., 1992). In addition, work by Cronin and her colleagues at USDA helped determine the range of servings (five to nine) needed to maintain good health (Cronin et al., 1987). Finally, the recommendation to eat five or more servings a day was used by NRC in its *Diet and Health* report (1989), USDA/DHHS in their dietary guidelines (1990), DHHS in its year 2000 objectives (1990), and USDA in its *Food Guide Pyramid* (1992).

Although the need to consume vegetables and fruit has been a part of dietary guidance in the United States for more than a century, the importance of the number "5" was new to most Americans. The 5 A Day baseline survey, conducted in October 1991, indicated that only 8 percent of the population was aware that people should be eating five or more servings per day.

The use of a single number was part of a broader program strategy. Several important strategies of the 5 A Day Program set it apart from past nutrition interventions. First, by providing the public with a number, similar to the strategy for cholesterol education, it gave people a measurable goal. They could easily calculate this goal for

themselves, unlike determining the percentage of calories from fat. In addition, it is not necessary to be tested by a health professional to know whether the goal is being achieved. Quantification raised people's awareness of how far they were from the goal. In fact, at baseline, 66 percent of the population thought two or three servings were adequate for good health.

Second, the focus on vegetables and fruit greatly simplified the information people needed to understand in order to make dietary changes. The complete set of dietary guidelines is a lot of information for people to absorb at one time. Good communications strategies suggest that shorter, simpler, and actionable messages are more likely to be heeded than complex ones. In addition, the program always promoted vegetables and fruit in a low-fat total diet context so that an increase in vegetable and fruit consumption should also help decrease fat consumption.

Third, this campaign promoted a positive message about diet, telling people they could eat more of the foods they liked. This was in contrast to the low-fat message, which encouraged people to eat less of what they liked. For the produce industry, this was a win/win campaign. Previous public health campaigns suggesting dietary fat reduction were initially resisted by the meat, dairy, and processed-food industries. In this case, the produce industry could sell more product without needing to make many product modifications and could easily redirect some of its advertising dollars to help promote a public health message. In constructing this program, care was taken to not disparage other food groups.

SUMMARY

The top leadership of NCI in the 1980s and early 1990s recognized the role of nutrition in cancer prevention and expanded the research and policy frontiers. Support of the high-fiber cereal message opened the door for the concept of health claims on food labels. NCI's policy documents promoted the development of chemoprevention research and research in dietary behavior change. The summary of vegetable and fruit research by NCI epidemiologists supported the 5 A Day effort. In addition, it was the creative public health perspective of NCI leadership that enabled a hybrid program (part research, part national educational program) such as 5 A Day to develop.

The national 5 A Day Program was based on a trendsetting project developed by the California Department of Health Services. It was founded on a sound epidemiological scientific basis and was backed by a number of national policy documents. The best concepts that community-based research had to offer at the time were incorporated into the Program. The design has served the Program well and has proven to be flexible and robust over time. Major components of the program—point-of-sale initiatives (supermarkets and food service), media, community, and research—have created a breadth of focused activity designed to change behaviors (see Chapters 2 to 6). With its extensive infrastructure, the Program can continue to be effective if the intensity and creativity of the media, the community, and research efforts are renewed and sustained.

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